

### Remarks:

Claims 1-3, 5-10, 12-16 and 18-20 remain pending in the Subject Application. Claims 1-3, 5-10, 12-16 and 18-20 stand rejected. Claims 1, 14, and 15 have been amended to remove the subject matter previously added from claims 11 and 17 as originally filed. New claims 21-22 have been added herein, incorporating subject matter that was contained in claims 11 and 17 as originally filed. Thus, no new matter has been added herein.

### Rejections – 35 U.S.C. § 103

Claims 1-3, 5-10, 12-16 and 18-20 stand rejected under 35 U.S.C. § 103(a) as having been obvious over U.S. Patent No. 3,981,838 to Wilson et al. (“Wilson”) in view of U.S. Patent No. 5,389,711 to Westbrook et al. (“Westbrook”). Of the rejected claims, claims 1, 14, and 15 are independent. Applicants traverse this rejection for the reasons set forth herein.

The Patent and Trademark Office recently published new guidelines for determining obviousness (“Guidelines”). See Examination Guidelines for Determining Obviousness Under 35 U.S.C. 103 in View of the Supreme Court Decision in KSR International Co. v. Teleflex Inc. The Guidelines reiterate that the framework for the objective analysis for determining obviousness lies in *Graham v. John Deer Co.* Obviousness is a question of law based on three underlying factual inquiries:

- (1) Determining the scope and content of the prior art;
- (2) Ascertaining the differences between the claimed invention and the prior art;  
and
- (3) Resolving the level of ordinary skill in the pertinent art.

The Guidelines further articulate the Examiner’s role in making a determination of obviousness:

When making an obviousness rejection, Office personnel must therefore ensure that the written record includes findings of fact concerning the state of the art and the teachings of the references applied. (emphasis added)

Once findings of fact are articulated, Office personnel must provide an explanation to support an obviousness rejection under 35 U.S.C. 103. 35 U.S.C.

132 requires that the applicant be notified of the reasons for the rejection of the claim so that he or she can decide how best to proceed.

The key to supporting any rejection under 35 U.S.C. 103 is the clear articulation of the reason(s) why the claimed invention would have been obvious. The Supreme Court in *KSR* noted that the analysis supporting a rejection under 35 U.S.C. 103 should be made explicit. (emphasis added)

The Guidelines lay out the Applicant's burden "[o]nce Office personnel have established the *Graham* factual findings and concluded that the claimed invention would have been obvious..." The Applicant respectfully submits that the Examiner has not met the burden in establishing a *prima facie* case of obviousness. First, the Examiner has failed to discuss the three factual inquiries under *Graham v. John Deer Co.* Further, the Examiner has failed to make an explicit analysis based on the factual inquiries as to why the claimed invention is obvious in light of the factual inquiries. However, in the interest of furthering prosecution of the Subject Application, the Applicant presents the following reply, assuming, hypothetically, that the Examiner had met the burden.

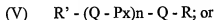
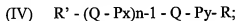
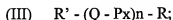
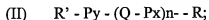
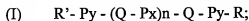
The Guidelines recite the following:

Prior art is not limited just to the references being applied, but includes the understanding of one of ordinary skill in the art. The prior art reference (or references combined) need not teach or suggest all claim limitations; however, Office personnel must explain why the difference(s) between the prior art and the claimed invention would have been obvious to one of ordinary skill in the art...The gap between the prior art and the claimed invention may not be "so great as to render the [claim] nonobvious to one reasonably skilled in the art." (emphasis added)

In the case at hand, the differences between the prior art and independent claims 1, 14, and 15 are "so great as to render the [claims] nonobvious to one reasonably skilled in the art." Claims 1, 14 and 15 share several common elements, at least, for example, they comprise:

a) from about 1 to about 98 wt% a thermoplastic elastomer, which is **a block copolymer** having at least one soft block and at least one hard block;

b) from about 1 to about 70 wt% **a phase change solvent** having the general formula:



a mixture thereof;

wherein Q is an unsubstituted difunctional aromatic moiety; P is CH<sub>2</sub>; R and R' are the same or different and are independently selected from H, CH<sub>3</sub>, COOH, CONHR<sub>1</sub>, CONR<sub>1</sub>R<sub>2</sub>, NHR<sub>3</sub>, NR<sub>3</sub>R<sub>4</sub>, hydroxy, or C<sub>1</sub>-C<sub>30</sub> alkoxy; wherein R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub> and R<sub>4</sub> are the same or different and are independently selected from H or linear or branched alkyl from C<sub>1</sub>-C<sub>30</sub>; x is an integer from 1 to 30; y is an integer from 1 to 30; and n is an integer from 3 to 7; and

c) from about 1 to about 70 wt% of **a processing oil** selected from the group consisting of poly (alpha olefins), olefinic oligomers, mineral oils, paraffinic oils, isoparaffinic oils, naphthenic oils, petrolatum, waxes, or mixtures thereof producing a glass transition temperature of greater than 85°C for a polystyrene homopolymer;

d) wherein the phase change solvent has **a phase change** in a temperature range from about 40°C to about 250°C.

In the Office Action dated October 9, 2007 ("October Action"), the Examiner reasserts the rejections set out in the Office Action dated March 22, 2007 ("March Action"). In the March Action, the Examiner alleges that claims 1-3, 5-10, 12-16 and 18-20 are obvious over Wilson in view of Westbrook. However, the differences between the prior art and independent claims 1, 14 and 15 are clear and nonobvious. The combination of Wilson and Westbrook fails to teach or suggest at least the block copolymer, phase change solvent, phase change temperature range, or processing oil of independent claims 1, 14 and 15. Therefore, the gap between the prior art and

the claimed invention is so great as to render the [claims] nonobvious to one reasonably skilled in the art.

In the March Action, the Examiner alleges that Wilson:

identifies thermoplastic resins to which the compound can be added, see column 4, lines 4+ and column 6, lines 31-40. The difference between the claimed invention and this disclosure is that the patent fails to specifically identify the claimed thermoplastic elastomer and oil. The thermoplastic elastomer is a species of the thermoplastic polymer listed in the patent.

The Applicant respectfully disagrees with the Examiner's interpretation of Wilson. Claims 1, 14 and 15 require block copolymers. A copolymer is a polymer synthesized from 2 or more different monomer units. There are various different types of copolymers, including alternating copolymers, random copolymers, and block copolymers. Alternating copolymers alternate between the various monomers in a regular way along the polymer chain. For example, an alternating copolymer made from monomer units "A" and "B" may comprise: A-B-A-B-A-B-A-B... In the alternative, a random copolymer alternates between the various monomers in an irregular way along the polymer chain. For example, a random copolymer made from monomer units "A" and "B" may comprise: A-B-B-A-B-A-A-B-A-B-B... Typically, alternating and random copolymers are synthesized through free radical polymerization techniques.

Block copolymers are very different from alternating and random copolymers in their construction, their method of synthesis, and their ultimate physical properties. In a block copolymer, the monomer units form "blocks" of each monomer unit that are connected to each other. For example, a block copolymer made from the monomer units "A" and "B" may comprise: A-A-A-A-A-B-B-B-B-B-A-A-A-A-A-B-B-B-B-B... In order to construct such a specific sequence, block copolymers are typically synthesized through ionic or "living" polymerization techniques. Block copolymers can have special properties because like-blocks of the polymer chains associate to form discrete structures in a phenomenon known as phase separation. This phenomenon is unique to block copolymers, as are the techniques by which block copolymers are made and the properties that result.

Wilson teaches the use of PVC, PVC-VA, ABS, and MBS polymers. PVC is a homopolymer (made up of a single type of monomer unit) and is not a copolymer. PVC-VA,

ABS, and MBS are either alternating, random, or a blend of random copolymers. They are NOT, however, block copolymers. Nowhere in Wilson are block copolymers taught or suggested. Because of the distinctions explained herein, one of ordinary skill in the art would NOT find block copolymers obvious from the Wilson disclosure, as the Examiner alleges. In fact, given the knowledge generally available and known by one of ordinary skill in the art regarding the clear differences between block copolymers and other types of polymers, whether they are homopolymers or copolymers, Wilson should be considered to teach away from block copolymers. By this distinction alone, claims 1-3, 5-10, 12-16 and 18-20 are not obvious over Wilson in view of Westbrook, and withdrawal of the rejection is respectfully requested.

In the March Action, the Examiner also alleges that “Wilson shows ester compounds that read on applicants claimed solvent compound, *see* column 3 lines 25+.” The Examiner alleges that “the claimed Q is the substituted aromatic phthalate or trimellitic acid.” Claims 1, 14 and 15, as amended, recite an unsubstituted difunctional aromatic moiety. Wilson clearly requires a substituted trifunctional aromatic moiety. Thus claims 1-3, 5-10, 12-16 and 18-20 are not obvious over Wilson in view of Westbrook, and withdrawal of the rejection is respectfully requested.

In the March Action, the Examiner concedes that Wilson does not disclose processing oils. In the October Action, the Examiner alleges that “these process oils are conventional oils and the incorporation thereof is obvious.” Once again, however, the Applicant respectfully disagrees. It is true that processing oils are known to lower viscosity to aid in processing. However, “due to their low molecular weight and their softness and/or fluidity down to room temperature, these agents tend to reduce the mechanical properties of [polymers].” (*See* specification, page 2, lines 8-11) Minimizing the negative impact that processing oils have on the mechanical properties of block copolymers is further complicated when used in block copolymers by the structure of block copolymers.

These block copolymers are known to have high strength and elasticity at ambient temperatures. The high strength and elasticity of these block copolymers are due to the microphase separated network structure wherein the olefinic blocks and the alkenylarene blocks separate from structurally dissimilar blocks and entangle with structurally similar blocks to form separate domains. The olefinic blocks typically have a glass transition temperature below ambient temperature, thus,

they are relatively free to move about and form the soft, rubbery phase at or above ambient temperature. In contrast, the alkenylarene blocks have a glass and/or crystalline transition temperature above the ambient temperature, thus, they are relatively immobilized in the entangled state and form the hard phase. However, at body temperature, the copolymers may begin to lose their mechanical properties after some time. The deterioration of properties appears to be associated with the copolymer movements, especially the movements of the alkenylarene blocks. At body temperature, sometimes accompanied with tension or load, the previously immobile alkenylarene blocks begin to slip past neighboring alkenylarene blocks. Since the alkenylarene blocks form the hard phase, which are primarily responsible for the mechanical properties, such motions of the alkenylarene blocks adversely affect the mechanical properties of the copolymer. The relative hardness of the alkenylarene blocks can be assessed by the value of a measured glass transition temperature. A high glass transition temperature indicates strong interactions and restricted motion of the styrenic chains, which ultimately leads to tensile strength. Conversely, low glass transition temperatures indicate the motion of molecules can occur easier and causes a drop in tensile performance.

See specification, beginning at page 2, line 32. Thus, in order to minimize the impact on mechanical properties, processing oils of the present invention must maintain a glass transition temperature (Tg) of the styrenic blocks above a critical threshold. A processing oil's effect on a polystyrene homopolymer is a useful analog in predicting the processing oil's effect on the styrenic blocks of the block copolymers of claims 1, 14 and 15. A polystyrene homopolymer typically has a Tg around 100°C. In order to achieve the objects of the invention of claims 1, 14, and 15, the processing oil must produce a glass transition temperature of greater than about 85°C for a polystyrene homopolymer.

There are important differences between mineral and synthetic processing oils which greatly affect the oils' ability to blend and intimately mix with the rubber phase while not plasticizing the hard phase of the block copolymer. See specification, page 6, line 34 to page 7, line 27. The use of synthetic oils in combination with the phase change solvents of claims 1, 14 and 15 provides unexpected benefits in tensile strength and long time force relaxation. Specification, page 7, lines 16-17. For example, the table on page 17 of the specification compares four different compositions. Each comprises a block copolymer, a phase change solvent, and a processing oil composition. It would be expected by one of ordinary skill in the art, as evidenced by the specification and by the Westbrook reference (described below), that the addition of any processing oil would decrease viscosity, but also deteriorate mechanical

properties. Examples 2 and 4, which have 100% and 50% synthetic oil, respectively, (and the balance mineral oil) in the processing oil composition show superior and unexpected improvement in both viscosity and tensile strength over examples 1 and 3, which have 0% and 25% synthetic oil, respectively (and the balance mineral oil) in the processing oil composition. Thus, the incorporation of the specific processing oils in claims 1, 14 and 15 is not obvious over Wilson in view of Westbrook, and withdrawal of the rejection is respectfully requested.

As discussed herein, Wilson does not teach or suggest the use of a block copolymer, the phase change solvent, or the processing oil recited in claims 1, 14 and 15. To reiterate this point in a different manner, Wilson does not teach or suggest any element of claims 1, 14 and 15. In this case, the gap between Wilson and the inventions recited in claims 1, 14 and 15 is “so great as to render the [claims] nonobvious to one reasonably skilled in the art.” Withdrawal of the obviousness rejection is respectfully requested.

The Examiner has continuously cited Westbrook “to further show the art recognized conventionality of using aromatic ester compounds as plasticizers in thermoplastic elastomer compositions irrespective of their structure, column 7, line 30+ and column 9, lines 1+.” It has been argued by the Applicant that Westbrook does not render claims 1-3, 5-10, 12-16 and 18-20 obvious, however, the Examiner’s only direct response was an Advisory Action dated July 24, 2006, where the Examiner alleged that “the claims are not limited to ‘non-functionalized’ polymers and do not exclude functionalized polymers suggested in Westbrook.” This, however, is not the standard used to judge whether or not claims are obvious over prior art. The proper standard is set out at the beginning of the Remarks, herein. The Examiner has not met his burden with regard to the Westbrook reference, and even so, claims 1-3, 5-10, 12-16 and 18-20 are not obvious over Westbrook, alone or in combination with Wilson.

Claims 1-3, 5-10, 12-16 and 18-20 and the compositions of Westbrook comprise different materials that function under a completely different mechanism. It is undisputed by the Examiner that Westbrook teaches the use of functionalized polymers called ionomers. In particular, the ionomers of Westbrook incorporate salt and sulfonic functional groups. Generally, *see* column 1, lines 50-64. The functional groups are specifically taught at column 6 lines 44-45 (carboxylic acid salt) and line 57 (sulfonic). Westbrook teaches that the functional

groups form ionic bonds in the polymer which improve mechanical properties. *See* column 1, lines 50-68; column 2, lines 15-30. A further purpose of grafting these functional groups is explained in column 8, lines 21-41:

It is theorized that the unexpected effectiveness of dicarboxylic acids which are capable of forming anhydrides may be due to the fact that the diacid forms the anhydride and water during processing. The water which is formed may solvate ionic bonds, allowing much easier disassociation of the bonds and thereby enhance molecular flow. The anhydride-dicarboxylic acid-water combination will exist in the polymer melt in an equilibrium at elevated temperatures. At lower temperatures, the equilibrium will favor the dicarboxylic acid form and thus water will be removed from the ionic crosslinks.

(emphasis added) Thus, Westbrook teaches grafting salt or sulfonic functionality onto the polymer chain. The polymer chains form ionic bonds between the functional groups in order to increase mechanical properties. The salt or sulfonic groups combine with the plasticizer in order to release water, which has a plasticizing effect on the ionic bonds, making the polymer easier to process. In contrast to Westbrook, claims 1, 14 and 15 comprise a block copolymer which forms a microphase separated network in order to increase mechanical properties instead of the ionic bonds taught in Westbrook. Above  $T_g$ , the phase change solvent and processing oils in claims 1, 14 and 15 act as compatibilizers to break down the microphase separated network and therefore decrease viscosity. *See* page 2, lines 13-15. This is in stark contrast to the polymer and plasticizer of Westbrook that combine above  $T_g$  to produce water which acts as a plasticizer of the ionic bonds.

As stated herein, the Examiner has continuously cited Westbrook “to further show the art recognized conventionality of using aromatic ester compounds as plasticizers in thermoplastic elastomer compositions irrespective of their structure.” (emphasis added) This is not accurate, however. For example in column 2, lines 52-63, Westbrook actually teaches away from using certain aromatic ester compounds because they cause a decrease in  $T_g$  and mechanical properties. Therefore, Westbrook does not teach the use of aromatic ester compounds “irrespective of their structure,” as the Examiner alleges. Westbrook only teaches the use of aromatic ester compounds that combine with the functional groups to form water in order to plasticize the ionic bonds. Again, this is contrary to the compositions and mechanisms of claims 1, 14 and 15.



Finally, Westbrook teaches away from the use of all processing oils in column 2, lines 5-9: “[t]ypical plasticizers, such as processing oils...improve processability of styrene block functionalized styrene-butadiene block copolymers, but only at the expense of many of the physical properties which the functionalization is intended to improve.” The Applicant has found the use of certain processing oils in addition to the phase change solvent of claims 1, 14 and 15 can improve processability while to a certain extent maintaining physical properties.

To summarize, Westbrook teaches grafting salt or sulfonic functionality onto the polymer chain to form ionic bonds between the functional groups in order to increase mechanical properties. The salt or sulfonic groups combine with the plasticizer in order to release water, which has a plasticizing effect on the ionic bonds, making the polymer easier to process. In contrast to Westbrook, claims 1, 14 and 15 comprise a block copolymer which forms a microphase separated network in order to increase mechanical properties instead of the ionic bonds taught in Westbrook. Above T<sub>g</sub>, the phase change solvent and processing oils in claims 1, 14 and 15 act as compatibilizers to break down the microphase separated network and therefore decrease viscosity. In addition, Westbrook does NOT teach that all aromatic ester compounds are suitable to plasticize thermoplastic elastomers, but only ones that produce water in conjunction with salt or sulfonic functionality. Finally, Westbrook additionally teaches away from the use of processing oils, while it has been discovered by the Applicant that certain processing oils can improve viscosity without sacrificing mechanical properties. The composition of claims 1, 14 and 15 and the compositions of Westbrook comprise different materials that operate under completely different mechanisms. One of ordinary skill in the art after reading Westbrook would not in any way be motivated to modify those teachings to create what is recited in claims 1, 14 and 15. The differences between the material described in Westbrook and claims 1, 14 and 15 are such that they would not have been obvious to one reasonably skilled in the art. In this case, the gap between the prior art and the claimed invention is so great as to render the claims nonobvious to one reasonably skilled in the art.

Claims 1-3, 5-10, 12-16 and 18-20 are not obvious over the Wilson reference in view of the Westbrook references. Applicants respectfully request withdrawal of the obviousness rejection.

**Conclusion:**

Applicants respectfully submit that all of the claims pending in the Subject Application upon entry of the amendments herein are in condition for allowance. Applicants request issuance of a Notice of Allowance at an early date. If the Examiner has any remaining concerns, he is invited to contact the undersigned at the telephone number set forth below so that such concerns may be expeditiously addressed.

Respectfully submitted,



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